

Biology 341: General Ecology

Course Outline Spring 2016

Phillip Dustan

Introduction:

Ecology embraces many aspects of all other biological and physical sciences. It is truly an open-ended field of study. In this particular course we shall focus on the biology of ecology and its politics will undoubtedly creep in. We shall explore the abiotic (physical factors) of the earth that set the stage for the structure of ecosystems. Then we shall examine communities, and the fundamentals of population biology: the evolution, growth, and regulation of populations in nature. The course will finish with the concepts of community ecology and global ecology.

The laboratory will be a combination of natural history, field trips and a project (1 to 3 people). You will be expected to keep a journal describing your experiences on field trips and field work. For many of you this may be your first experience in field biology. Buy a bound composition book, be sure to wear field clothes and be prepared to get your hands dirty, capture bugs, and learn how to avoid poison ivy, and to think and do experiments in Nature. Special precautions should be taken against insect bites, especially ticks and mosquitoes which may carry Lyme disease or West Nile Virus.

The learning outcomes for this course include understanding:

1. How abiotic forcing functions control the distribution of biodiversity on Earth.
2. The principles of biogeochemistry; the interaction of organisms with their chemical environment.
3. The flow of energy and molecules through ecosystems: terrestrial vs oceanic communities.
4. The role density dependent vs density independent control in the growth and regulation of populations.
5. The mathematics describing the growth and regulation of populations of living organisms.
6. The theory of species diversity.

Critical Thinking:

Critical thinking is the common denominator between all forms of analysis. As a “college or university student, there is no more important goal than that of developing your mind, as everything you do in your life will be affected by your mind and how it operates. The quality of your learning is affected by the quality of your thinking about learning. The quality of your personal relationships is affected by the quality of your thinking about those relationships. To take command of the thinking that controls your life, you must cultivate your intellect”. (Refer to www.criticalthinking.org)

Honor Code: All class work must be your own original work and must not have been submitted for a grade in any other class while at the College of Charleston or elsewhere. Furthermore, no project done in this class may be submitted for grading in any other present or future course. To do so will be construed as a clear violation of the Honor Code. More information can be found in the *Student Handbook* at <http://www.cofc.edu/generaldocuments/handbook.pdf>

Absences: I adhere to the College of Charleston Absence Policy as stated in the Student Handbook. If you miss a lecture be sure to get the notes from another student. If you miss an exam I expect you to present me with a Dean’s excuse or other acceptable documentation. If you miss a lab be prepared to make up the experience and entry in your lab book.

Course requirements:

Lecture: Three (3) class exams, one original research paper and one final exam = 75% of grade
Laboratory: Field Laboratory Notebook and original research project (presentation and written report) = 25% of grade
Text: Ecology by Cain, Bowman, Hacker, Sinaur Press 2015 (3rd edition) and Reading Packet at Sasse Ink

Term Paper: You are required to complete a term paper. Your topic MUST be discussed with me before you begin or you will not be given credit for the work. The grade you receive for this work will carry the weight of an in-class examination. An outline of your paper is due on **March 22, 2016** and the final paper is due at the start of class on **April 7, 2016** without exception.

Science is an ongoing progression of ideas that are built on previous work. Your assignment is to report on the current state of knowledge of an ecological or evolutionary process of your choosing, NOT a thing or an organism, but an actual Ecological or Evolutionary Process. **You may not write a paper on global warming, coral bleaching, beach erosion, or any other topic dealing with pollution or man’s impact on the Biosphere.** Start your project by finding a paper in the recent peer-reviewed scientific literature that is central to your interest. Then research the topic using other papers from the literature. After you have done some reading on your chosen topic make an appointment to discuss it me. The paper should be at least 2500 words of text, cite a minimum of 10 peer-reviewed papers plus any other references you choose to use, and must be typed (Times Roman font, 11 or 12 pica, double spaced). Submit both paper copy and email electronic copy.

Filename = YOUR LAST NAME_PAPER_B341S2016.DOC).

Laboratory components:

1. **Laboratory notebook** demonstrating day to day work and participation in laboratory and an active knowledge of the scientific method (see **Laboratory Field Trips** below). This is due in class on **April 7, 2016**. **Please dress for the weather and you must wear closed shoes on field trips. You will not be allowed to participate if you wear sandals, crocs, flip flops, Tevas, etc. Use of tobacco products are not permitted on field trips and cell phones only in the van.**

2. **Original research project** carried out with 1 to 3 people. Results will be reported in writing and as an oral presentation. Grading will be based on your question, methods, data, a written report, and a presentation to your peers.

3. Laboratory Field Trips:

We will be visiting a number of habitats, mostly forest ecosystems, during the course of the semester. A significant part of your lab grade will be based on the quality of your laboratory notebook, a journal which documents your participation in lab and shows me that you observed some aspect of nature. There are three parts to a laboratory report:

1. The first part of a lab report should consist of your field notes written in your notebook while on the trip. These will obviously be rough notes jotted down “on the fly”
2. The second section of a report should be a detailed summary of the field trip using field notes and other information. (where, what, descriptions, species lists, photographs, etc). This should be written every week before the next lab and should consist of approximately 300-800+ words.
3. The third part is a short report based on your observations and peer reviewed literature which discusses some ecological process that was encountered on the trip, succession, zonation, competition, predation, life history of a curious animal or plant, etc. This should be written every week before the next lab and should consist of approximately 400-800+ words and documented with outside references.

Your **notebook MUST be a hardbound notebook** (i.e. Gradeschool marbled finish type) and you must bring it on all fieldtrips and have it initialed on that day by the trip leader. Your **field notes MUST be hand written**. Field trip summary and short reports may be handwritten or typed. The **reports MUST be in sequence with the three sections comprising a lab report** for the week’s outing with no more than one page between reports. The format of typed **pages MUST fit the page size of your notebook and must be permanently mounted to pages** in the notebook in the proper order as described above or you will not get credit for the notebook. It is due to me on or before **March 22, 2016** before the start of lecture.

Reading List: There will be an optional reading packet available from Sase-Ink on Calhoun St.

Interesting Journals: Ecology, American Naturalist, Applied Ecology, Oecologia, Limnology and Oceanography, Trends in Ecology and Evolution, and. PLOS1

Office Hours:

9-10 Tues/Thurs (Please not just before class) or by appointment.

Room 210/114 Harbor Walk West Telephone 953-8086

Email - dustanp@cofc.edu (note: just because you sent me an email does not mean I received it immediately)

Policy on electronic devices: All cell phones/pda/laptops computers, and other portable electronic devices may be used during class and laboratory hours as long as they do not disturb anyone in the class. No such devices may be on during examinations. You may be asked to leave the classroom if your phone goes off or you text excessively during class.

Grading Policy: The grading policy for this course:

A : 92-100 excellent and creative	A-: 89-92	
B+ : 86-89 very good	B : 82-86 good	B-: 79-82
C+ : 76-79 fair	C : 72-76 acceptable	C-: 69-72
D+ :68-69 passing	D : 65-68	D-: 63-65
F : < 63 failing	XF: Failure due to Academic Dishonesty	

Final grades are supposed to reflect how much you have progressed and/or learned in the timespan of a course. Please read my Grading Rubric for Ecology (5th page). With this in mind, one could suggest that an average student receives an average grade, a very good student a higher grade, and an excellent and creative student the highest grade. Course grade = .5 tests + .25 final + .25 lab.

General Ecology Biology 341
Course Schedule Spring 2016 P. Dustan
Ecology by Cain, Bowman, Hacker

Date	Topic	Ch = chapters in text, R# = reading packet
7 Jan	First Day: introductions, outline, viewpoints and perspectives	
12 Jan	the Biosphere (Ch 2, 3, 4, R#1, R#14, R# 23)	
	Earth: the fitness of the environment water, carbon, and light (CH 2, 3, R#12)	
14 Jan	Climates on a rotating Earth solar angle, adiabatic cooling, Coriolis force, biomes (Ch. 2, 3, R# 2)	
19 Jan	Law of tolerance, Principle of Similitude, Constraints, Periodicities (Ch 4)	
21 Jan	Communities: definition, identity, diversity, Change, succession and climax (Ch. 15) Guest Lecturer	
26 Jan	Scaling, Ecosystem thermodynamics, limiting factors, Ecosystem Homeostasis, (R#20, R#25)	
28 Jan	***** Exam #1 ***** (Jan 7 through Jan 29: Biosphere through Scaling)	
2 Feb	Productivity: theory & background (Ch 5, 19)	
4 Feb	Productivity: photosynthesis and measurement	
9 Feb	Ecological efficiency & trophic structure Ch 20, R# 8)	
11 Feb	BioGeochemistry: Theory, water and carbon (Ch 21, 24, R#'s 3, 5, 18, 19)	
16 Feb	Biogeochemistry continued (R# 17, 11)	
	Forest ecosystems: soils and nutrients. (Ch 21)	
	Hubbard Brook Experimental Forest (R#s 6, 15, 16)	
18 Feb	Marine /aquatic productivity (McAllister,C.D.,T.R.Parsons,K.Stephans,and D.H. Strickland 1961 Measurements of primary production in coastal sea water using a large volume plastic sphere, Limnology and Oceanography 6:237-258, Ch 19, 21, R#7)	
23 Feb	***** Exam #2 ***** (February 2 through Feb 18: Productivity and Biogeochemistry)	
25 Feb	Evolutionary Ecology Chapters 6, 7 and 8	
1 Mar	Genetics- Review Mendelian Inheritance	
3 Mar	Hardy-Weinberg Equilibrium and its consequences	
6-13 Mar	Spring Break Week	
15 Mar	Lamarck, Darwin, Fitzroy, and Wallace: Evolution by Natural Selection Reading : Boag, P.T. and P.R. Grant: Intense natural selection in a population of Darwin's finches (Geospizinae) in the Galapagos, Science 2 Oct 1981,v214:82-84, R# 9, R#10))	
17 Mar	Genetic variation, genetic load, cost of selection and Natural Selection Vernal Equinox (spring) Saturday, March 19 2016 23:30hrs EST	
22 Mar	The Modern Synthesis: Evolution and speciation: or What is a species? ***** Laboratory Notebooks due at start of class period *****	
24 Mar	Geographic Variation (Ch. 8) ***** Term Paper outline due at start of class period *****	
29 Mar	Population Ecology Chapters 9 and 10	
	Population growth and regulation 1: life tables to the Logistic Equation	
31 Mar	***** Exam #3 ***** (Mar 10 through Mar 31 topics: Evolutionary Ecology)	
5 Apr	Population growth and regulation 2: R and K selection	
7 Apr	Species interactions: modifications to the Logistic Equations (Ch. 11,12.1 and 13) *****Term papers due at start of class period *****	
12 Apr	Island Biogeography (Ch. 17)	
14 Apr	Species Diversity (Ch. 15, 17, 18)	
19 Apr	Global Ecology, Models , Human Impacts Project Presentations in Lab this week	
28 Apr	Final Exam scheduled for Tuesday April 28, 8-11am	

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Disclaimer: The material presented in this handout is for your information. It is subject to scheduling changes and other alterations as necessary.

Laboratory Schedule

Lab is scheduled for Tuesday afternoon (2:10-6:10pm). There will be no makeup labs. On days we use vans, we will embark from the Harbor Walk West parking lot. **DO NOT WEAR OPEN SHOES, SANDLES, FLIPFLOPS, CROCS, TEVAS, etc on field trip days. YOU WILL BE LEFT IN THE PARKING LOT IF YOU DO NOT WEAR CLOSED SHOES. The use of tobacco products is not permitted on field trips and no cell phone use outside the vans please.**

Week	Dates	Tentative Destination / Activity
1.	12 Jan	Campus and urban ecology
2.	19 Jan	Folly Beach maritime forest, beach and bridges*
3.	26 Jan	Project design, planning, and implementation
4.	2 Feb	Dixie Plantation coastal forest*
5.	9 Feb	Santee Coastal Reserve longleaf pine forest*
7.	16 Feb	Plum Island Sewage Treatment Plant
8.	23 Feb	Chasing Ice
9.	1 Mar	BP Lands – Corporate land management and conservation*
10.	8 Mar	***Spring Break***
11.	15 Mar	Beidler Forest: old growth cypress swamp \$4.00 admission charge *
12.	22 Mar	Project Time Lab notebooks due in lecture today
13.	29 Mar	Project Time – submit progress report
14.	5 Apr	Project time
15.	12 Apr	Project time
15.	19 Apr	Project Reports: Oral with written reports due at time of presentation

*College van transportation

*potential late arrival home

Grading Rubric for Ecology (BIOL 341):

	Excellent 4	Above Average 3	Average 2	Below Average 1
Question selection	Identifies a creative, focused, and manageable topic that addresses potentially significant yet previously less explored aspects of the topic.	Identifies a focused and manageable/doable topic that appropriately addresses relevant aspects of the topic.	Identifies a topic that while manageable/doable, is too narrowly focused and leaves out relevant aspects of the topic.	Identifies a topic that is far too general and wide-ranging as to be manageable and doable.
Existing knowledge, research, and/or views	Synthesizes in depth information from relevant sources representing various points of view/approaches.	Presents in depth information from relevant sources representing various points of view/approaches.	Presents information from relevant sources representing limited points of view/approaches.	Presents information from irrelevant sources representing limited points of view/approaches.
Methods	All elements of the methodology or theoretical framework are skillfully developed.	Critical elements of the methodology or theoretical framework are appropriately developed however more subtle elements are ignored or unaccounted for.	Critical elements of the methodology or theoretical framework are missing, incorrectly developed or unfocused.	Inquiry design demonstrates a misunderstanding of the methodology or theoretical framework.
Analysis	Organizes and synthesizes evidence to reveal insightful patterns, differences, or similarities related to focus.	Organizes evidence to reveal important patterns, differences, or similarities related to focus.	Organizes evidence but the organization is not effective in revealing important patterns, differences or similarities.	No apparent organization. Evidence is not used to support assertions.
Organization	The presentation is carefully organized and provides convincing evidence to support conclusions.	The presentation has a focus and provides some reasonable evidence to support conclusions.	There is some organization, but the speaker occasionally goes off topic. Evidence used to support conclusions is weak.	No apparent organization. Evidence is not used to support assertions.
Content	The content is accurate and comprehensive. Listeners are likely to gain new insights about the topic. Clear and creative graphics	The content is generally accurate and reasonably complete. Listeners may develop a few insights about the topic. Interesting graphics	The content is sometimes inaccurate or incomplete. Listeners may learn some isolated facts, but they are unlikely to gain new insights about the topic. Acceptable graphics	The content is inaccurate or overly general. Listeners are unlikely to learn anything or may be misled. Poor graphics
Delivery	The speaker is professional, relaxed, and comfortable and interacts effectively with listeners.	The speaker is generally relaxed and comfortable. Listeners are generally recognized and understood.	The speaker occasionally appears anxious or uncomfortable, and may occasionally read notes, rather than speak. Listeners are often ignored or misunderstood.	The speaker appears anxious and uncomfortable and reads notes, rather than speaks. Listeners are ignored.

SAFETY POLICY AND PROCEDURES

The School of Sciences and Mathematics of the College of Charleston understands that the safety of our students, staff and faculty is of paramount importance. Engendering a safety culture is an important part of our mission in teaching and doing science. Each department, course of instruction, or research lab may require higher standards or procedures. The policies and procedures set forth below are understood to be minimum requirements across our departments.

In this document, the term "laboratory" is meant for a work space/facility where chemicals, biological agents, or equipment is used for research and/or instruction.

No one (student, staff, faculty, or visitor) will be allowed in a laboratory (teaching or research) to perform experiments or where experiments may be in progress unless these regulations are followed.

Students dismissed from a teaching lab due to violations of the safety procedures will not be allowed to re-enter the laboratory until authorized to do so by their supervisor (instructor) and, in the case of research laboratories, by the department chair or designee. Any course work missed because of a violation of these guidelines cannot be made up at another time (or by an extension of the lab period) and will be treated as an unexcused absence.

1. You are responsible for knowing the biological, chemical, electrical, ergonomic, mechanical, and physical hazards associated with the equipment and materials that are being utilized in the laboratory. Listen to all instructions and ask questions about that which you do not understand.
2. Know the location of safety equipment: telephones, emergency shower, eyewash, fire extinguisher, fire alarm pull.
3. Know the appropriate emergency response procedures. If there is an injury or emergency, call 9535611.
4. Do not work alone in the laboratory if you are working with hazardous materials or equipment.
5. Use hazardous chemicals, equipment, and biological agents only as directed and for their intended purpose.
6. Do not engage in horseplay, pranks or other acts of mischief while in lab.
7. Drinking, eating, and application of cosmetics is forbidden in laboratories where chemicals or biohazards are present. Smoking is forbidden in all College buildings.
8. Appropriate personal protective equipment shall be worn. The dress code for laboratory work when using chemicals, biological or physical hazards, or when instructed to do so by the laboratory supervisor is as follows:
 - a) Wear safety glasses or goggles at all times.
 - b) No exposed skin on arms, legs or torso.
 - c) Wear lab coats or other approved protective garments.
 - d) Wear gloves or other personal protective equipment (PPE) as directed by the instructor or mandated by prudent practices based on the chemicals being handled. If in doubt, wear appropriate gloves. Latex is not permitted. Avoid cross-contamination.
 - e) Remove PPE (gloves and lab coat) when exiting the laboratory.
 - f) Wash your hands, even if gloves were used, before leaving a lab where you did any lab work.
 - g) Closed toe shoes are required. The heel and top of foot must be covered. High heeled shoes, sandals, and perforated shoes are not permitted.
 - h) Confine long hair and loose clothing.
9. Inspect equipment or apparatus for damage before adding chemical reagents or biological samples or energizing electrical equipment. Do not use damaged equipment.
10. Never remove chemicals, biological samples, or laboratory equipment from a lab without proper authorization.
11. Presume that all chemicals and biological samples used in the laboratory are hazardous for you and the environment, unless instructed otherwise.
12. Never leave an experiment unattended unless proper safety precautions are in place.

13. Read all labels on chemicals twice before using them in the lab. Read all instructions twice for the operation of any equipment or machinery.
 14. Properly and safely dispose of all waste materials.
 15. Treat sharps and broken glassware containers carefully. a) Broken glass should be disposed of in properly marked safety containers. All sharps (needles, razor blades, etc.) used for any purpose must be disposed of in specially labeled SHARPS containers. b) Do not place contaminated glass in the broken glassware container. Consult your supervisor. c) Waste chemicals and contaminated PPE should be discarded as directed.
 16. When using a reagent, replace the lid immediately. Never return unused reagents to stock bottles. Take only the amount needed for your experiment.
 17. All chemicals and biological samples/media are to be disposed of in appropriately labeled containers. Specific instructions for each material will be provided. Pay attention to waste container labels before adding the material to be discarded.
 18. Use good personal hygiene. Keep your hands and face clean. Wash hands thoroughly with soap and water after handling any chemical or biological agent.
 19. Keep the work area clean and uncluttered with chemicals and equipment. Clean up the work area on completion of an operation or an experiment. Before leaving the laboratory, you are responsible for making sure your lab area is clean and organized.
 20. Never store a chemical or biological specimen in an unlabeled container.
1. Always have your College of Charleston identification and insurance information with you when working in a laboratory. MedicAlert identification must be worn if you have any potential life-threatening chemical sensitivities or medical conditions.
 2. Report any accident or injury, however minor, to your teaching assistant, instructor, or lab supervisor immediately. An accident report form must be completed and forwarded to the department chair, dean, and to the Director of Environmental Health and Safety.

If you have questions/concerns about safety in the lab please first consult your instructor. If these are not answered, please see the department chair. Finally, you may consult the director of Environmental Health and Safety, Randy Beaver at 3-6802 or beaverr@cofc.edu

Adopted: March 7, 2012

Release Form:

It is the policy of the College of Charleston that all students sign a liability waiver form in order to participate in field trips. Please sign and have two people witness your signature. Then hand it in today.

COLLEGE OF CHARLESTON
LIABILITY RELEASE, EMERGENCY MEDICAL AUTHORIZATION
AND AGREEMENT
(Domestic Travel)

1. I _____, the undersigned student desire to participate in the following activity/trip _____ (“Activity”), to be held on _____.

I fully understand and appreciate the dangers, hazards, and risks inherent in the Activity, in the transportation to and from the Activity, and in any independent research or other endeavors I may undertake supplemental to the Activity. These dangers, hazards, and risks can result in injury and impairment to my body, general health and well being, and could include serious or even fatal injuries. I also understand that these dangers, hazards, and risk could include loss or damage to my personal property.

2. Knowing the dangers, hazards, and risks of such endeavors, and in consideration of being permitted to participate in the Activity, on behalf of myself, my family, spouse, heirs, and personal representative(s) (the “Releasers”), I agree to assume all the risks and responsibilities surrounding my participation in the Activity, the transportation to and from the Activity, and in any independent research or other acts undertaken as supplemental to the Activity, and on behalf of myself and the Releasers I hereby release, waive, forever discharge, and covenant not to sue the State of South Carolina, the College of Charleston, and its trustees, officers, agents, employees and any students acting as employees (“Releasees”), from and against any and all liability and for any harm, injury, damage, claims, demands, actions, causes of action, costs, and expenses of any nature that I may have or that may hereafter accrue to me or a Releaser, arising out of or related to any loss, damage, or injury, including but not limited to suffering and death, that may be sustained by me or by any property belonging to me, whether caused by the negligence or carelessness of the Releasees, or otherwise, while engaged in the Activity, any act supplemental to the Activity, or while I am in transit to or from the premises where the Activity or supplemental act occurs or is being conducted.

3. I further agree to indemnify and hold harmless the Releasees from and against any loss, liability, damage or cost, including court costs and attorneys’ fees that may arise due to my participation in the Activity.

4. It is my expressed intent that this **LIABILITY RELEASE, EMERGENCY MEDICAL AUTHORIZATION, AND AGREEMENT** (the “Agreement”) shall bind me, the members of my family and spouse, if I am alive, and my estate, family, heirs, administrators, personal representatives, or assigns, if I am deceased, and shall be deemed as a legally binding release, waiver, discharge and covenant not to sue the Releasees.

5. I understand, agree and hereby grant Releasees permission to authorize emergency medical treatment for me, if necessary, and that such action by Releasees shall be subject to the terms of this Agreement. I understand and agree that Releasees assume no responsibility for any injury or damage which might arise out of or in connection with such authorized emergency medical treatment.

6. By signing this Agreement, I acknowledge and represent that I have carefully read this Agreement and understand its contents and that I sign this document as my own free act and deed. I further state that I am at least eighteen (18) years of age and fully competent to sign this Agreement; and that I execute this Agreement for full, adequate, and complete consideration fully intending to be bound by the same. I further state that there are no health-related reasons or problems which preclude or restrict my participation in the Activity, and that I have adequate health insurance necessary to provide for and pay any medical costs that may arise as a result of an injury to me. I recognize that the College of Charleston (“College”) is not obligated to provide for any of my medical or medication needs or insurance and that I assume all risk and responsibility for those needs. If I am a driver and will be driving a vehicle (other than a College vehicle) during the period first stated above, I certify that I will, during such period, personally carry automobile liability insurance that includes medical payments coverage.

7. I further agree that this Agreement shall be construed in accordance with the laws of the State of South Carolina. If any term or provision of this Agreement shall be held illegal, unenforceable, or in conflict with any law governing this Agreement the validity of the remaining portions shall not be affected thereby.

8. If I am an employee of the College, I do not consider the Activity within the course and scope of my employment with the College. By signing below I also agree to comply with the College's Student Code of Conduct and all other College regulations regarding conduct, comportment, and academic integrity during my participation in the Activity. I understand that the College has the right to enforce such standards of conduct and that I may be dismissed from the Activity at any time for failing to abide by such standards. In the event of such dismissal, I shall forfeit all my fees and other payments to the College that are associated with the Activity and I shall be responsible for the payment of my transportation expenses to return to Charleston, South Carolina.

THIS IS A LEGAL AGREEMENT AND INCLUDES A RELEASE OF LEGAL RIGHTS. READ AND BE CERTAIN YOU UNDERSTAND IT BEFORE SIGNING.

Signature: _____ Date: _____

Print Name of Student: _____

If under 18, this form must **ALSO** be signed by a parent or legal guardian before student can participate.

(Print) Parent or Guardian

Signature

Date